# MicroMet-SnowModel Simulations for the Cold Land Processes Field Experiment (CLPX)

(Photo by Kenneth G. Libbrecht and Patricia Rasmussen)

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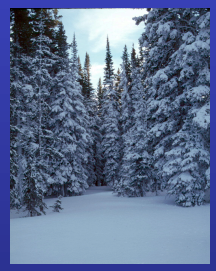
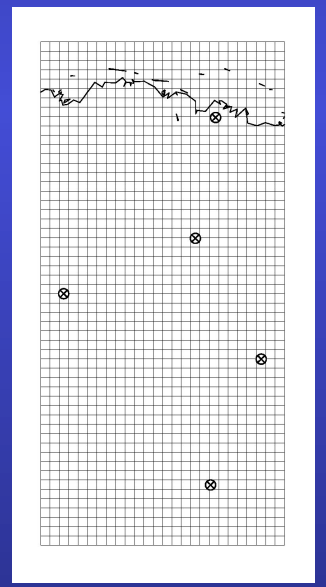
# A Meteorological Distribution System for High Resolution Terrestrial Modeling (MicroMet)

**Liston and Elder, J. Hydrometeorology (2006a)**

MicroMet produces high-resolution (e.g., 5-m to 5-km horizontal grid increments) meteorological data distributions required to run spatially distributed terrestrial models, including snow-evolution models:

1) air temperature,
2) relative humidity,
3) wind speed,
4) wind direction,
5) surface pressure,
6) incoming solar radiation,
7) incoming longwave radiation,
8) precipitation.





MicroMet: Station data are interpolated to a regular grid and physically-based adjustments are made to the interpolated fields.

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# **SnowModel**: A Spatially Distributed Snow-Evolution Modeling System (Liston and Elder, 2006b).

Includes:

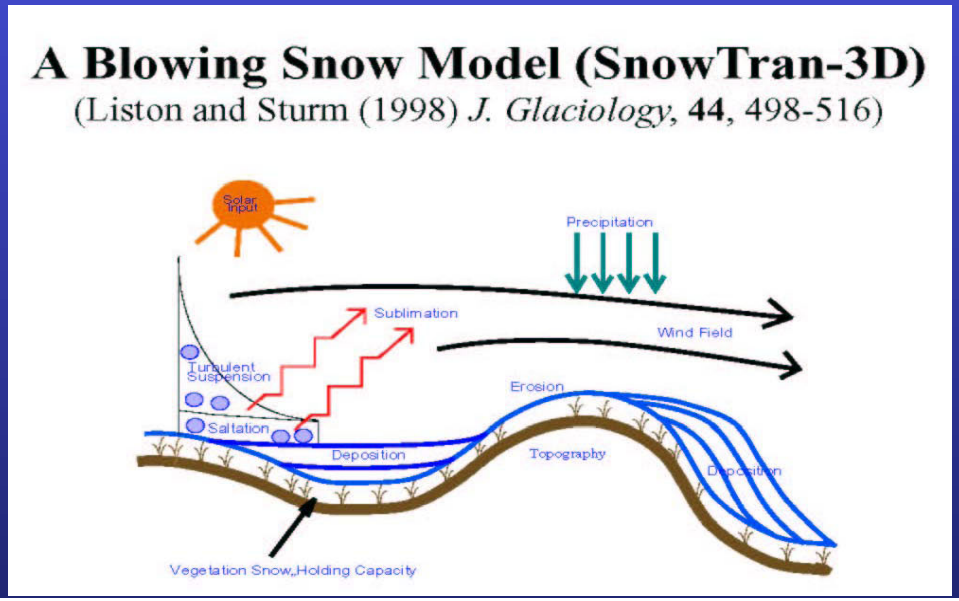
**MicroMet** – Micro-Meteorological Distribution Model (Liston and Elder, 2006a)

**EnBal** – Surface Energy Balance/Melt Model (Liston et al., 1999)

**SnowPack** – 1-D, Snowpack Model (Liston and Hall, 1995)

**SnowTran-3D** – Blowing and Drifting Snow Model (Liston and Sturm, 1998; Liston et al., 2007)

**SnowAssim** – Snow Data Assimilation Model (Liston and Hiemstra, 2008)

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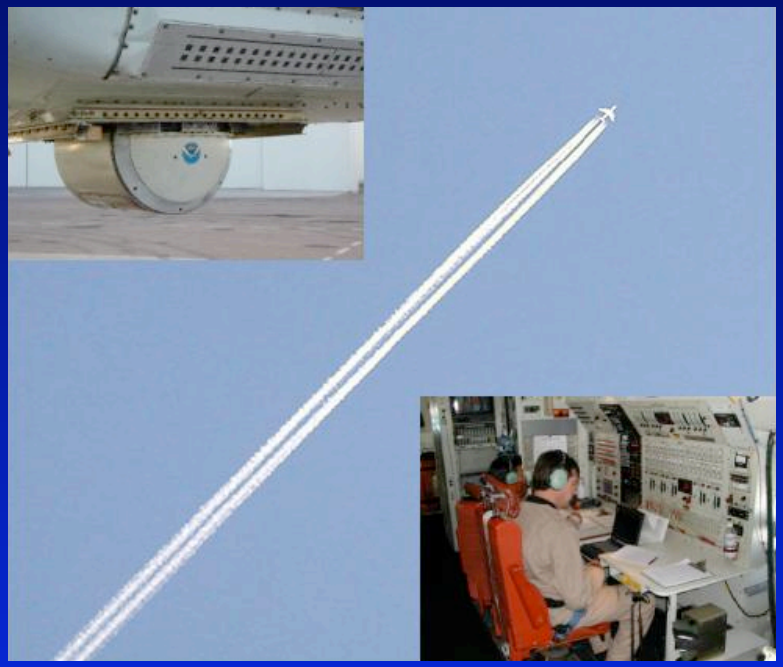
CLPX
2002 - 2003
NASA Cold Land Processes
Field Experiment
Data for Snow Research



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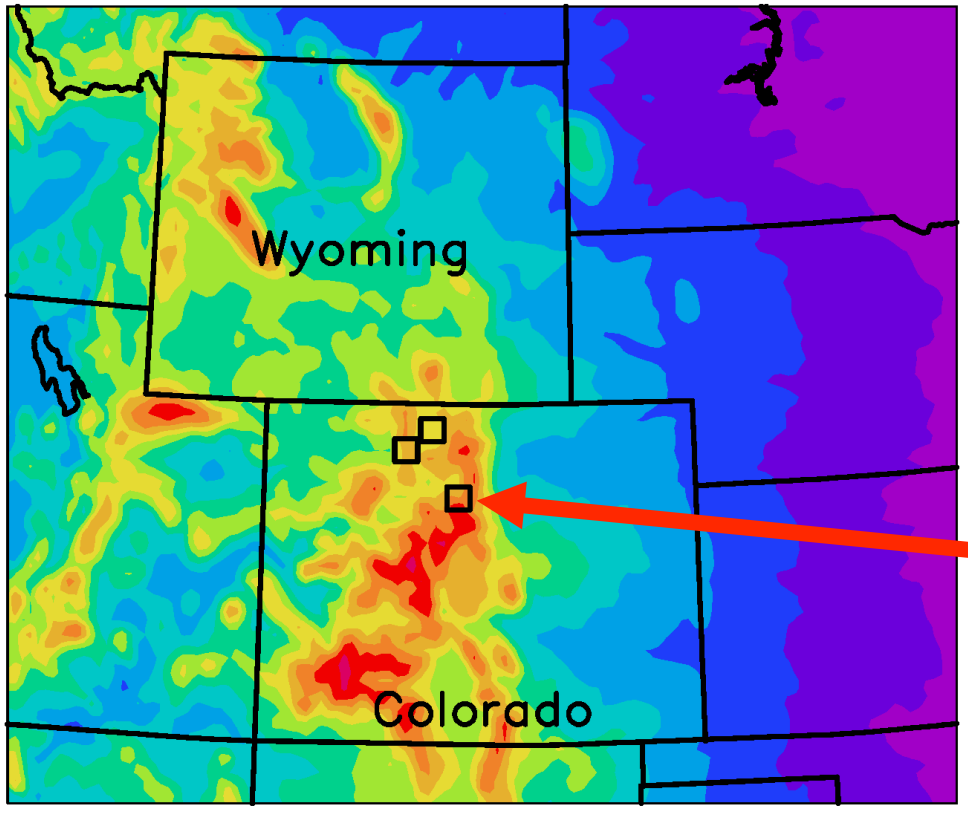
# NASA Cold Land Processes Experiment (CLPX)



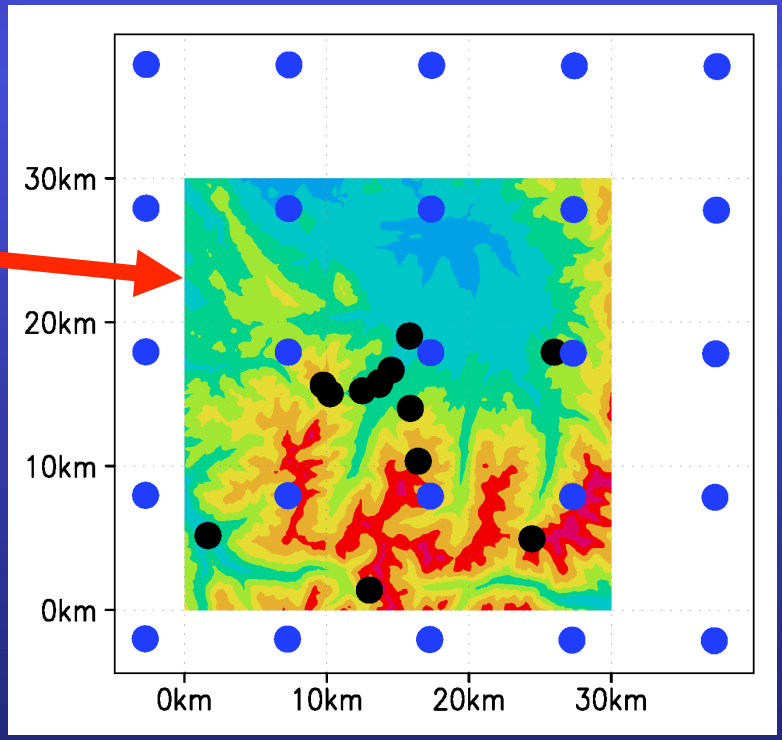

## Fraser Study Area:

**30-km by 30-km domain**

**Blue dots = atmos analysis model**

**Black dots = met stations**

**Grid increment = 30 m**

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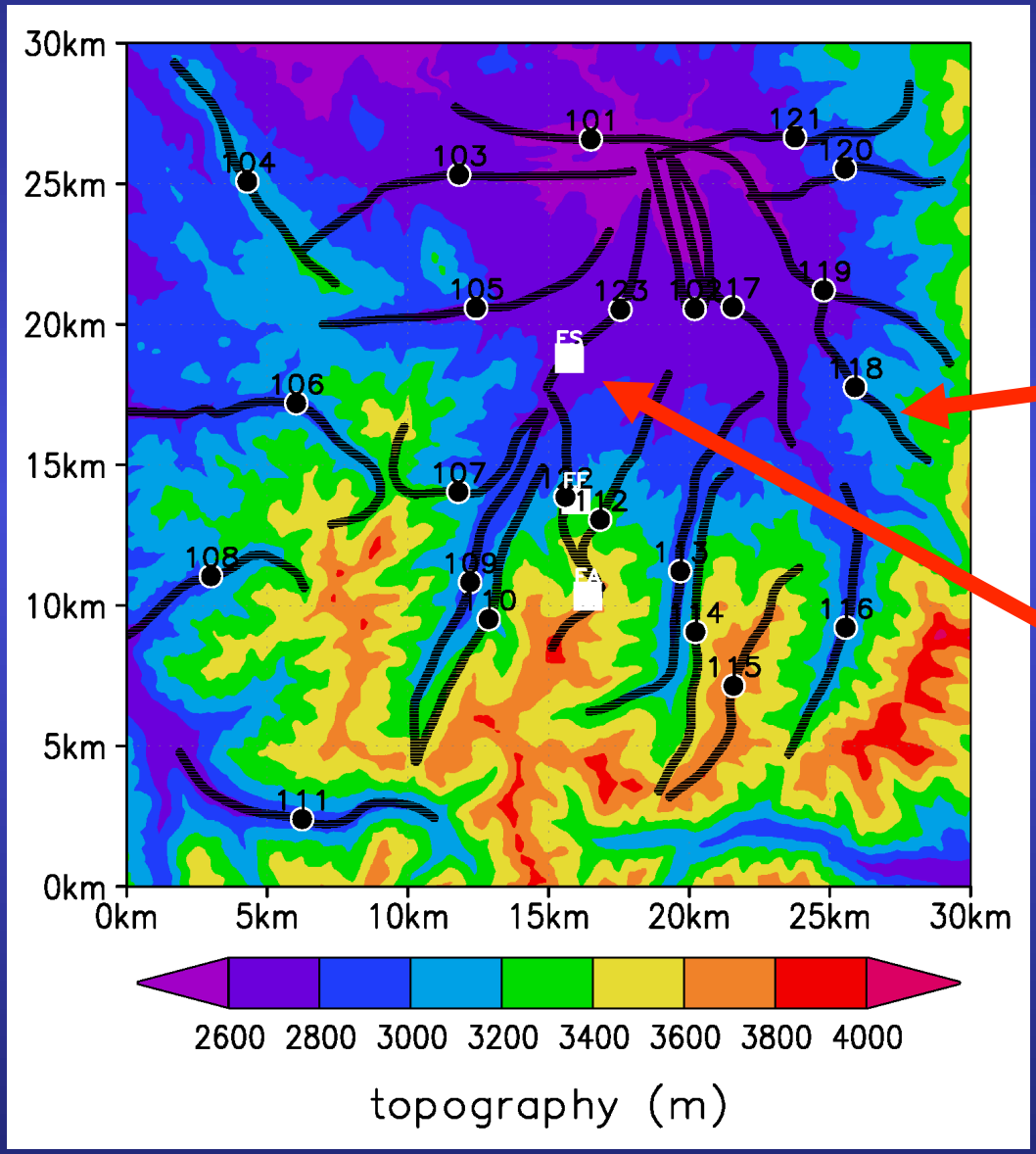
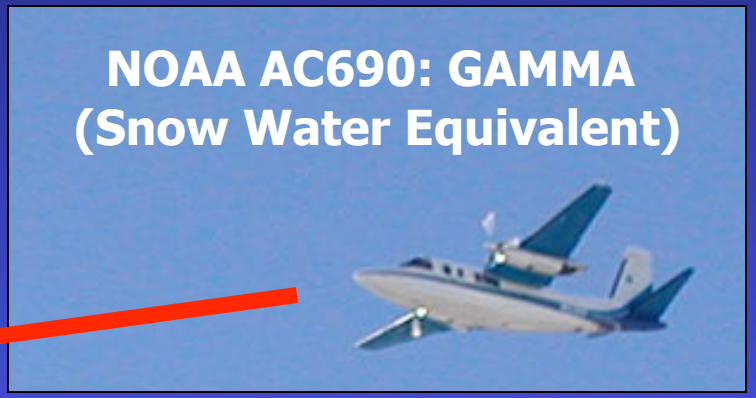
# Fraser Study Area: Data Assimilation Mask





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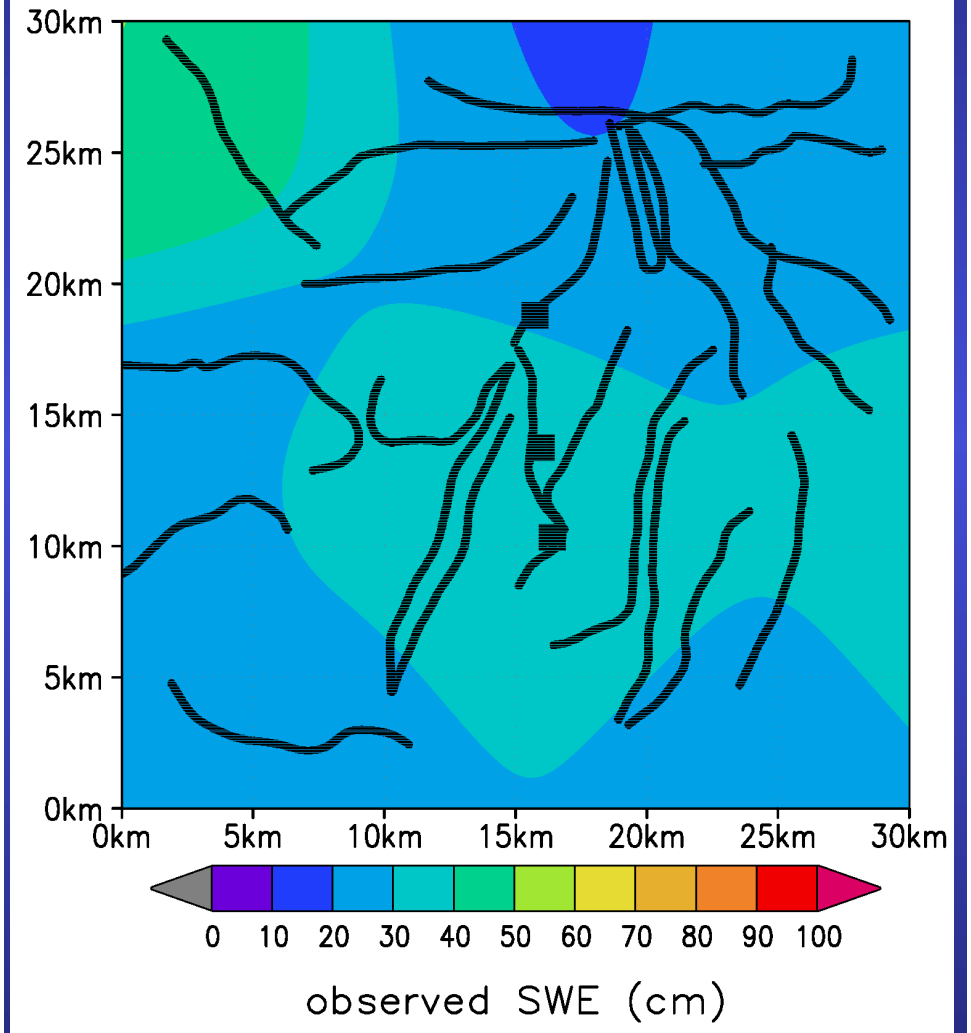
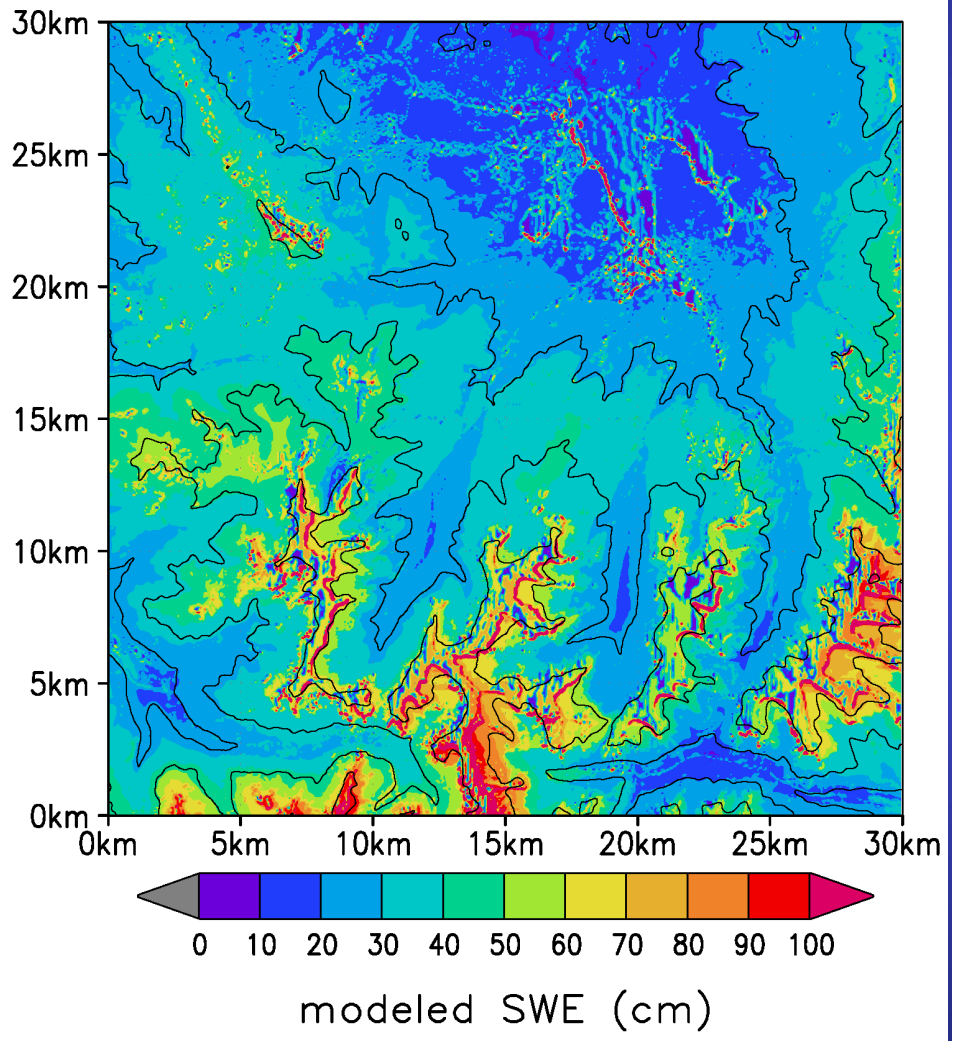
# Fraser Snow Water Equivalent (SWE) Distribution

## (25 March 2003; same total swe in each figure)

## Observed




## Modeled




**Gridded observations, with obs mask.**

**Black lines are topography.**

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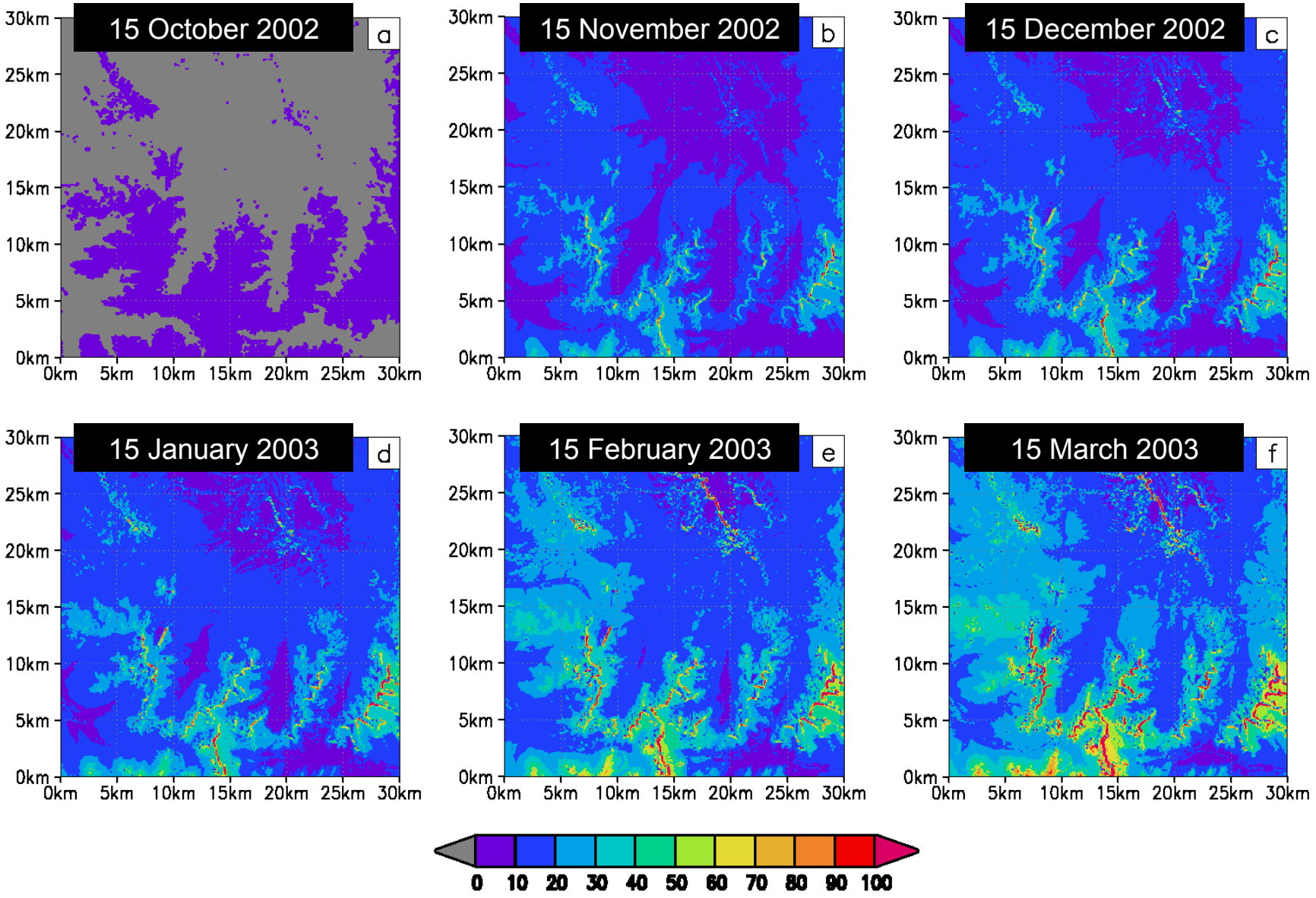


# Modeled, monthly SWE (cm) time evolution for the Fraser Study Area.

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# PAPERS:


Liston, G. E., and K. Elder, 2006a: A meteorological distribution system for high-resolution terrestrial modeling (MicroMet). *J. Hydrometeorology*, **7**, 217-234.

Liston, G. E., and K. Elder, 2006b: A distributed snow-evolution modeling system (SnowModel). *J. Hydrometeorology*, **7**, 1259-1276.

Liston, G. E., R. B. Haehnel, M. Sturm, C. A. Hiemstra, S. Berezovskaya, and R. D. Tabler, 2007: Simulating complex snow distributions in windy environments using SnowTran-3D. *Journal of Glaciology*, **53**, 241-256.

Liston, G. E., and C. A. Hiemstra, 2008: A simple data assimilation system for complex snow distributions (SnowAssim). *J. Hydrometeorology*, in press.

Liston, G. E., C. A. Hiemstra, K. Elder, and D. Cline, 2008: Meso-cell study area (MSA) snow distributions for the Cold Land Processes Experiment (CLPX). *J. Hydrometeorology*, in press.